The Frequency Characteristics of PbS Photoconductive Cells

B. T. Kolomiyets

Zhurnal Tekhnickeskoy Fiziki Volume 18, No 11, pages 1456-7.

Moscow/Leningrad : November 1948

THE FREQUENCY CHARACTERISTICS OF PbS PHOTO-CONDUCTIVE CELLS

B. T. Kolomiyets

[Note: The following brief report appeared in the regular "Letters to the Editors" section of the monthly periodical Zhurnal Tekhnicheskoy Fiziki, Volume 18, No. 11, 1948, pages 1456-7.]

During World War II, PbS photo-conductive cells possessing very wide bands of sensitivity in the infrared region of the spectrum were developed for the first time in Germany. A considerable number of articles in foreign periodical literature concerning both technology of manufacture and also their properties was devoted in the succeeding three years to these photo-conductive cells.

Concerning frequency characteristics, however, there was no detailed data. Only just recently have we gotten an article (1) dealing with the frequency characteristic of PbS photo-conductive cells, which differs only slightly from the characteristic of vacuum photo-tubes (photo-emissive cells). In another, earlier article (2), it is stated that the independence of photoelectric current upon frequency extends up to 5,000 cycles.

Interest in the frequency characteristic of any photocell is connected with the possibility of its utilization with sound film, i.e., in the largest field of application of photocells.

The absence of definite knowledge on the subject up to the present time may be an indication that the frequency characteristic is connected with the method of preparing photo-~~resistances~~ cond. cells. In this connection, it was of interest to establish the nature of frequency dependence of PbS photo-conductive cells developed at the Leningrad Physico-Technical Institute.

The results of investigations in this direction, ~~which were conducted at~~ carried out in Leningrad in the factory "Lenkinap" (Leningrad Cinema Equipment Plant) are shown in the figure appended. As follows from this figure, the frequency characteristics of PbS photo-~~resistances~~ cond. cells are quite favorable for sound reproduction. ~~As for~~ Other data on these photo-~~resistances~~ cond. cells, ~~they are~~ is as follow:

1. the internal resistance is from 0.03 to 3 megohms.

2. the integral sensitivity for a field of 470 V/cm is equal to 40 mA/lm, or 0.835 A/W for a light temperature of the light source equal to 2848° K and an illumination of 100 lux.

3. the spectral sensitivity is ~~as usual~~ normal for these photo-~~resistances~~ cond. cells; that is, the maximum lies near 2.5 microns, the red limit is 3.5 microns. The sensitivity extends to the entire visible region, ~~here around~~ and at 0.4 micron, ~~the sensitivity~~ it is ~~equals~~ about 10% of ~~the~~ maximum.

4. the investigated specimens possessed the dimensions 7 x 10 mm, with an area of light-sensitive surface of 3 x 7 mm.

As a result of preliminary tests at the ~~factory~~ plant "Lenkinap", PbS photo-~~resistances~~ cond. cells are being tested under actual operating conditions ~~of employment~~ in a number of cinema theaters in Leningrad and in several traveling cinemas operating in the Leningrad region. The cinema theater "Titan" has operated the longest time with these ~~photo-resistances~~ cells, namely since 23 March 1948.

The first attempts to use PbS photo-resistances for sound reproduction revealed such ~~successes~~ advantages as absence of natural (inherent) noise, and sensitivity 10 to 15 times the best sensitivity of cesium gas-filled photo-~~elements~~ cells.

Especially effective is the operation of PbS photo-~~resistances~~ cond. cells in ordinary black-white phonograms. The possibility of their use in colored cinema pictures is still not clear.

The first ~~attempts~~ direct tests in cinema theaters were made in October 1947.

In the present work the following persons took part: V. V. Muromtsev ~~(factory~~ technical supervisor "Lenkinap" plant); G. F. Andereg (Cinema Administration); N. B. Vishnyakov (~~works manager~~ technical supervisor at the "Titan" cinema theater); A. F. Antonov (~~works manager~~ technical supervisor at the "Union" cinema theater); and V. M. Bykhovskiy (student-graduate of Leningrad Institute of Cinema Engineers).

Literature

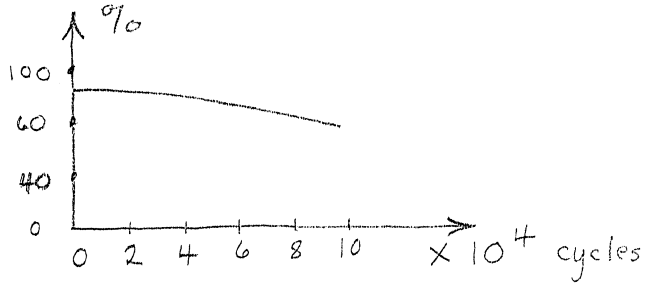
(1) R. J. Cashman. Journal of the Society of Motion Picture Ungrs [Engrs], October 1947, 132.

(2) A. J. Cashman [sic]. JOSA, 1946, 6, 356.

Leningrad Physico-Technical Institute
of Academy of Sciences of USSR

Submitted to the Editors
19 July 1948.

[figures follow]



The frequency characteristics of a PbS Photo~~resistance~~conductive Cell

- E N D -